Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claim 1 (Currently Amended): An automatic frequency control method for controlling the frequency of a radio receiving signal by compensating a frequency offset of the radio receiving signal, said radio receiving signal periodically including a plurality of adjacent known signals, ~~wherein~~ comprising:

estimating ~~the~~ a frequency of ~~the~~ a direct wave of the radio receiving signal and ~~the~~ a center frequency of ~~the~~ a Doppler spread of the radio receiving signal ~~are estimated~~ based on ~~the~~ distortion amounts of the adjacent known signals included in the radio receiving signal, and

compensating the frequency offset of the radio receiving signal ~~is compensated~~ based on both of ~~these frequencies~~ said frequency of a direct wave and said center frequency of a Doppler spread.

Claim 2 (Original): An automatic frequency control method according to claim 1, wherein the radio receiving signal is a burst signal synchronized with a predetermined time slot in the TDMA.

Claim 3 (Currently Amended): An automatic frequency control method for controlling the frequency of a radio receiving signal by eliminating frequency offset from the radio receiving signal, said radio receiving signal periodically including a plurality of adjacent known signals, comprising:

a frequency offset estimating step for estimating a frequency offset of the radio receiving signal from ~~the~~ a frequency of ~~the~~ a direct wave of the radio receiving signal, which is estimated based on ~~the~~ distortion amounts of the adjacent known signals included in the radio receiving signal, and ~~the~~ a center frequency of the Doppler spread of the radio receiving signal; and

a frequency offset eliminating step for eliminating the estimated frequency offset from the radio receiving signal.

Claim 4 (Original): An automatic frequency control method according to claim 3, wherein the frequency offset estimating step includes:

a distortion amount operating step for determining the distortion amounts of the known signals included in the radio receiving signal;

a first frequency offset estimating step for estimating the frequency of the direct wave of the radio receiving signal based on the distortion amounts between adjacent known signals among these determined distortion amounts;

a distortion amount frequency offset eliminating step for eliminating frequency offset from the distortion amounts of the known signals based on the estimated frequency of the direct wave;

a second frequency offset estimating step for estimating the center frequency of the Doppler spread of the radio receiving signal based on the distortion amounts between the periodically inserted known signals among the distortion amounts from which the frequency offset has been eliminated; and

a synthesizing step for synthesizing the phase amount corresponding to the frequency of the direct wave and the phase amount corresponding to the center frequency of the Doppler broadening to estimate frequency offset of the radio receiving signal.

Claim 5 (Original): An automatic frequency control method according to claim 4, wherein the first frequency offset estimating step includes steps of:

determining the phase difference vectors based on the distortion amounts between adjacent known signals among the determined distortion amounts;

determining the average phase difference vector by averaging the determined phase difference vectors for a predetermined period; and

estimating the frequency of the direct wave based on the determined average phase difference vector.

Claim 6 (Original): An automatic frequency control method according to claim 4, wherein the second frequency offset estimating step includes steps of:

determining the average distortion amount by averaging the distortion amounts from which frequency offset has been eliminated;

determining signal powers corresponding to a plurality of frequency offset candidates set at each predetermined interval within a predetermined frequency offset estimating range based on the determined average distortion amount;

determining the window signal power of all frequency offset candidates within the frequency offset estimating range by summing the signal powers of the frequency offset candidates in the frequency window with a predetermined frequency width among the determined signal powers; and

estimating the frequency offset candidate corresponding to the maximum value of the determined window signal power as the center frequency of the Doppler spread.

Claim 7 (Original): An automatic frequency control method according to claim 4, wherein the first frequency offset estimating step includes steps of:

determining phase difference information based on the distortion amounts between the adjacent known signals among the distortion amounts;

determining average phase difference information by averaging the determined phase difference information for a predetermined period; and

estimating the frequency of the direct wave based on the determined average phase difference information.

Claim 8 (Original): An automatic frequency control method according to claim 4, wherein the first frequency offset estimating step includes steps of:

determining signal powers corresponding to a plurality of frequency offset candidates set at each predetermined interval in a predetermined frequency offset estimating range based on the distortion amounts of the adjacent known signals among the distortion amounts;

determining window signal powers corresponding to all frequency offset candidates by summing signal powers corresponding to the frequency offset candidates in a frequency windows with predetermined frequency widths among the determined signal powers; and

estimating the frequency offset candidate corresponding to the maximum value of the determined window signal powers as the frequency of the direct wave.

Claim 9 (Original): An automatic frequency control method according to claim 3, wherein the frequency offset estimating step includes:

a distortion amount operating step for determining distortion amounts of the known signals included in the radio receiving signal;

a first frequency offset estimating step for estimating the frequency of the direct wave of the radio receiving signal based on the distortion amounts between the adjacent known signals among the determined distortion amounts;

an average distortion amount operating step for determining the average distortion amount by averaging the determined distortion amounts;

a signal power operating step for determining signal powers corresponding to a plurality of frequency offset candidates set at each predetermined interval in a frequency offset estimating range regulated by the estimated frequency of the direct wave based on the determined average distortion amount;

a window signal power operating step for determining window signal powers of all frequency offset candidates in the frequency offset estimating range by summing the signal powers of the frequency offset candidates in the frequency window with a predetermined frequency width among the determined signal powers; and

a second frequency offset estimating step for estimating the frequency offset candidate corresponding to the maximum value of the determined window singal powers as the frequency offset of the radio receiving signal.

Claim 10 (Original): An automatic frequency control method according to claim 3, further comprising a filtering step for eliminating high frequency components over the cutoff frequency from the radio receiving signal, wherein

the frequency offset estimating step is for determining the distortion amounts of the known signals by using the radio receiving signal from which the high frequency components have been eliminated; and

the frequency offset eliminating step is for eliminating the estimated frequency offset from the radio receiving signal whose high frequency components have not been eliminated by the filtering step.

Claim 11 (Original): An automatic frequency control method for controlling the frequency of a radio receiving signal by eliminating frequency offset from the radio receiving signal periodically including a plurality of adjacent known signals, comprising:

a first distortion amount operating step for determining the distortion amounts between the known signals included in the radio receiving signal;

a first frequency offset estimating step for estimating the frequency of the direct wave of the radio receiving signal based on the distortion amounts of the adjacent known signals among the determined distortion amounts;

a first frequency offset eliminating step for eliminating frequency offset corresponding to the estimated frequency of the direct wave from the radio receiving signal;

a second distortion amount operating step for determining the distortion amounts of the known signals included in the radio receiving signal from which the frequency offset has been eliminated;

a second frequency offset estimating step for estimating the center frequency of the Doppler spread of the radio receiving signal based on the distortion amounts between the periodically included known signal blocks among the determined distortion amounts;

a second frequency offset eliminating step for eliminating frequency offset corresponding to the estimated center frequency of the Doppler spread from the radio receiving signal.

Claim 12 (Currently Amended): An automatic frequency control ~~divice~~ device for controlling the frequency of a digital baseband signal by eliminating frequency offset from the digital baseband signal upon receiving the digital baseband signal outputted from an A/D converter as an input corresponding to a radio receiving signal which periodically includes a plurality of adjacent known signals, wherein ~~the~~ a frequency of ~~the~~ a direct wave of the radio receiving signal and ~~the~~ a center frequency of ~~the~~ a Doppler spread of the radio receiving signal are estimated based on the distortion amounts of the adjacent known signals included in the digital baseband signal, and frequency offset is eliminated from the digital baseband signal based on both frequencies.

Claim 13 (Currently Amended): A demodulator, comprising:

a frequency converter circuit for converting a radio receiving signal periodically including a plurality of adjacent known signals into an analog baseband signal;

an A/D converter circuit for converting ~~this~~ the analog baseband signal into a digital baseband signal;

a digital signal processing device~~, which~~ configured to

~~receives~~ receive the digital baseband signal generated by the A/D converter circuit as an input,

~~estimates~~ estimate the frequency of the direct wave of the radio receiving signal and the center frequency of the Doppler spread of the radio receiving signal

based on the distortion amounts of the known signals included in the inputted digital baseband signal,

~~eliminates~~ eliminate frequency offset from the digital baseband signal based on both frequencies, ~~and~~

~~eliminates~~ eliminate fading distortion from the digital baseband signal from which the frequency offset has been eliminated, and

~~then demodulates~~ demodulate the digital baseband signal.

Claim 14 (Original): A demodulator according to claim 13, wherein

the frequency converter circuit has a voltage control oscillation part, which oscillates a local oscillation signal for converting the radio receiving signal into an analog baseband signal, and changes the oscillation frequency of the oscillation signal in accordance with an applied voltage; and

the digital signal processing device eliminates frequency offset from the digital baseband signal by applying a voltage in accordance with both of the estimated frequencies to the voltage control oscillation part.